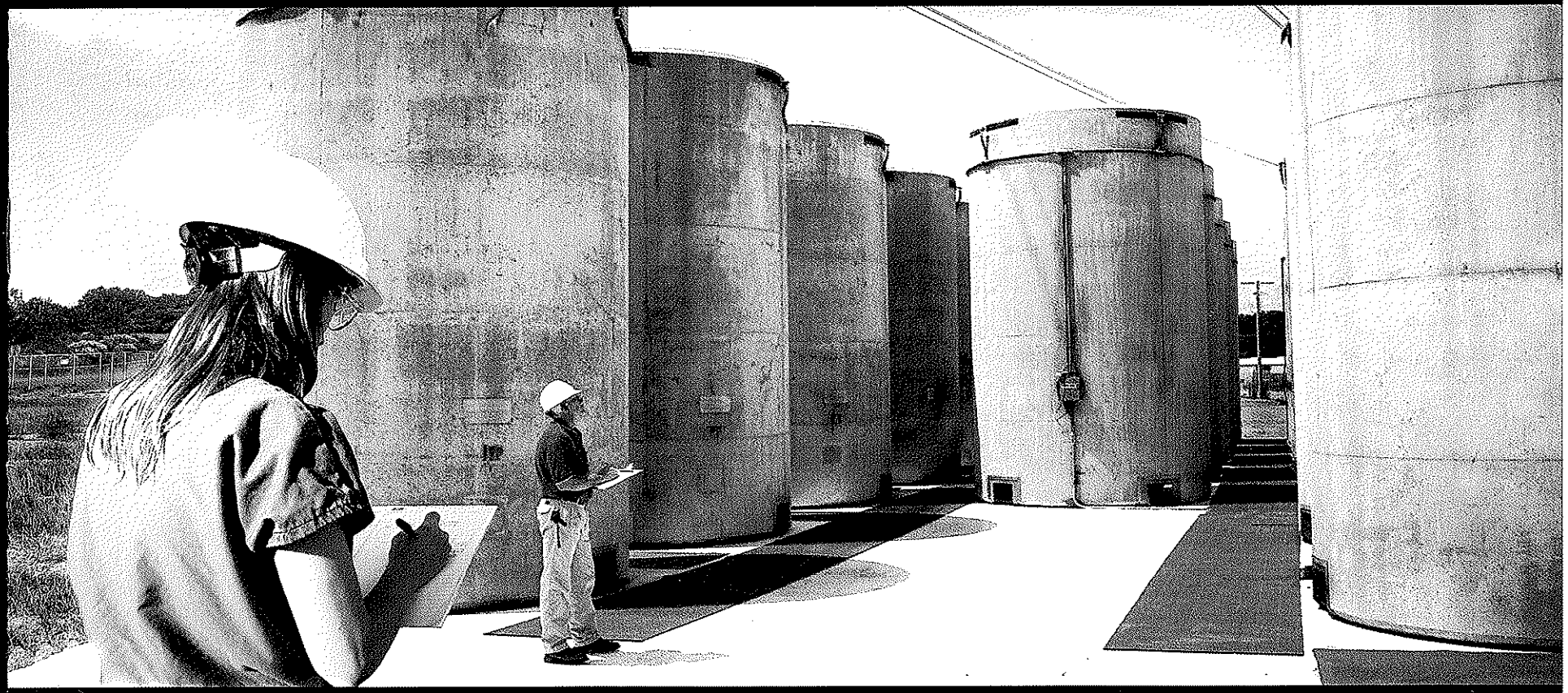
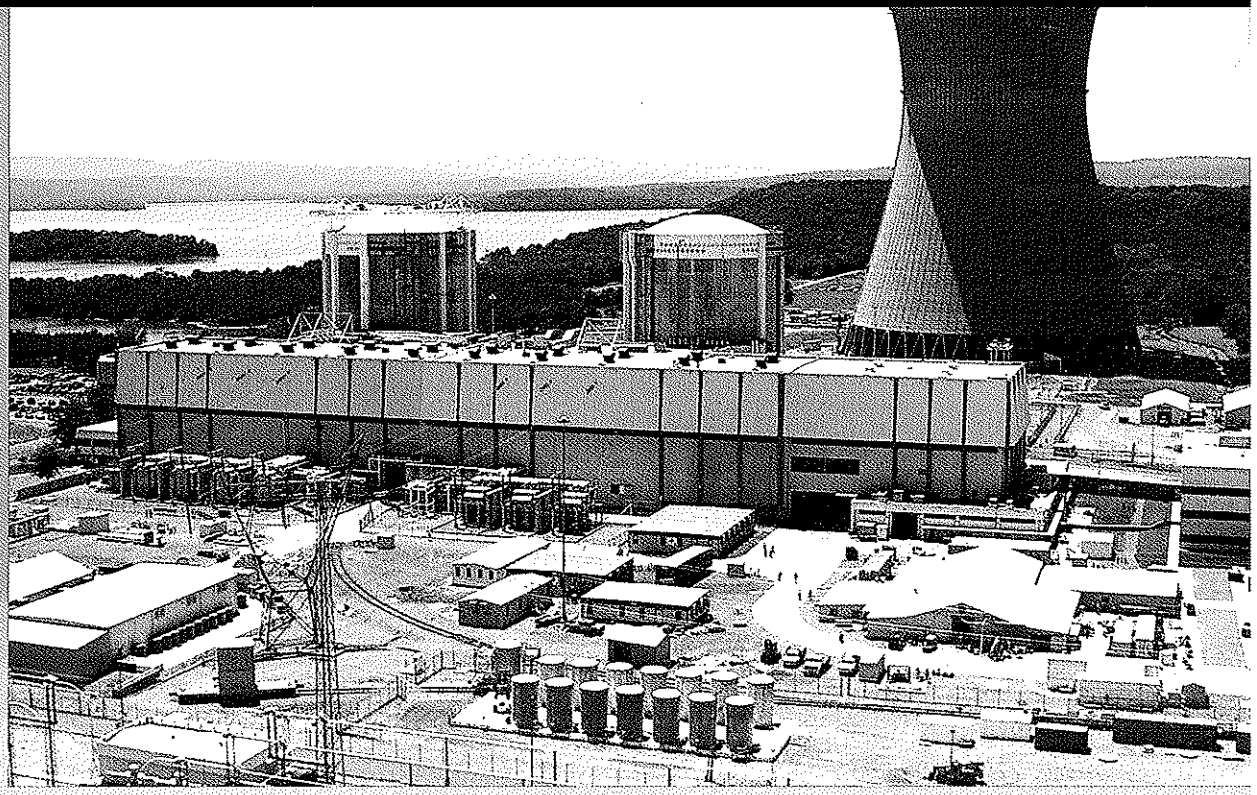


Used Nuclear Fuel

Handled With Care

How the nuclear energy industry manages used fuel at nuclear power plants

Storing Used Nuclear Fuel at Nuclear Power Plants



Today, more than 100 nuclear power plants generate 20 percent of the electricity in the United States—without producing any greenhouse gases.

A byproduct of nuclear energy is radioactive used nuclear fuel. The U.S. nuclear energy industry has safely managed used fuel for decades, carefully containing it from the environment. Ultimately, when the federal government takes responsibility for this material, as required by law, the U.S Department of Energy will continue the safe management of used nuclear fuel at a federal facility.

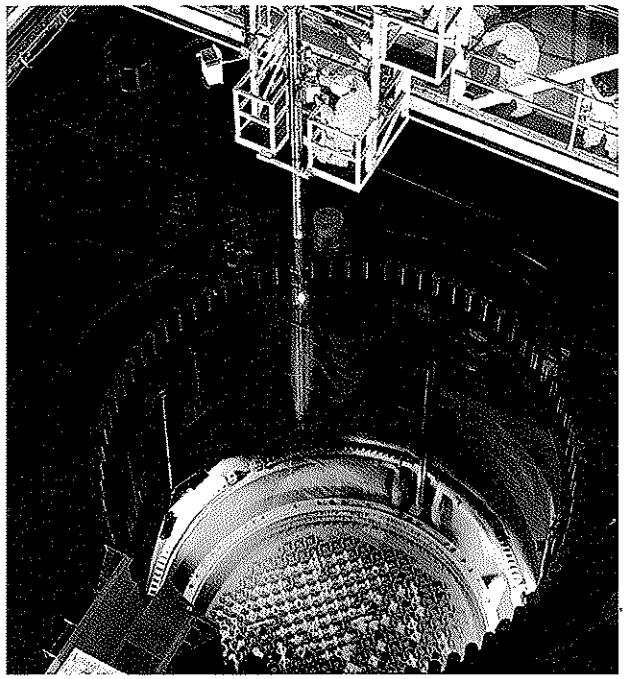
What Is Used Nuclear Fuel?

To generate electricity, nuclear power plants use uranium oxide. This solid fuel—in the form of small ceramic pellets—is placed inside metal fuel rods and grouped into bundles called fuel assemblies.

Fission involves the splitting of uranium atoms in a chain reaction. This produces a tremendous amount of heat energy that is used to boil water into steam. That steam, in turn, drives a turbine generator to produce electricity, distributed across power lines to homes, businesses and schools.

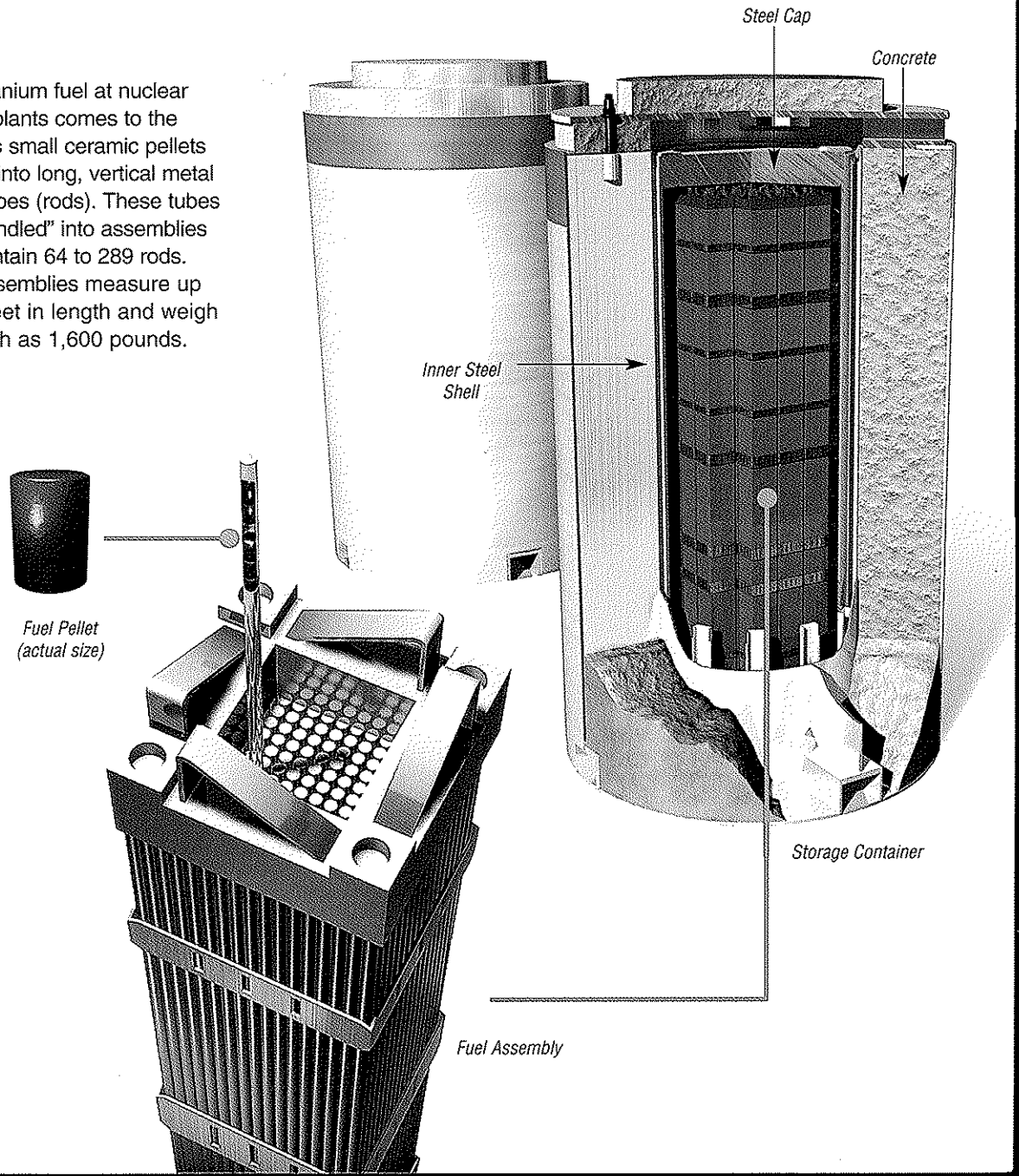
Over time, the energy in a nuclear plant's fuel is consumed, and every 18 to 24 months the plant is shut down, and the oldest fuel assemblies are removed and replaced by new ones.

Those assemblies, in the process of generating enormous amounts of energy, become intensely radioactive as a result of the fission process. Contrary to images in fictional movies or television programs, trained workers safely store and carefully manage this used fuel at the plant sites. It is solid and compact, and relatively small in volume.



Technicians carefully arrange fuel assemblies in the reactor.

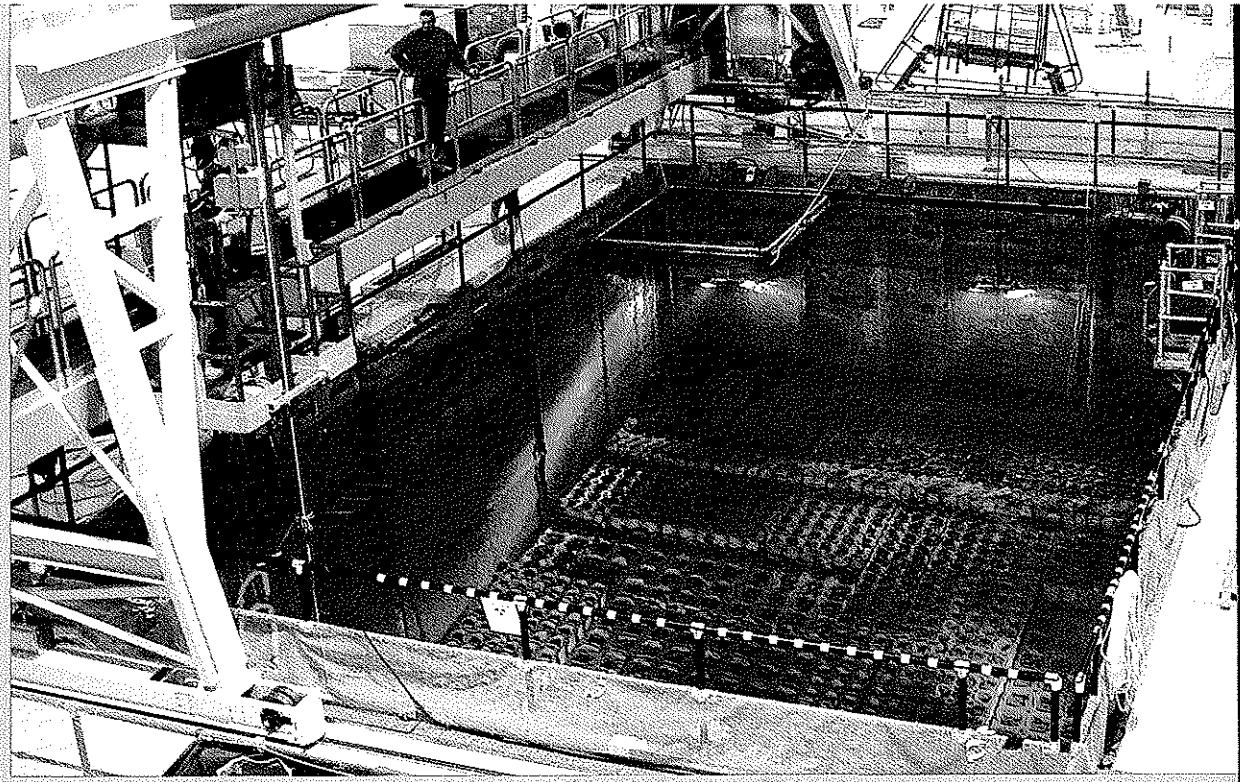
The uranium fuel at nuclear power plants comes to the plant as small ceramic pellets sealed into long, vertical metal alloy tubes (rods). These tubes are "bundled" into assemblies that contain 64 to 289 rods. The assemblies measure up to 14 feet in length and weigh as much as 1,600 pounds.



Plants Can Safely Store Used Fuel for Decades

The U.S. Nuclear Regulatory Commission has determined that used nuclear fuel can be stored safely and with minimal environmental impact for at least 30 years beyond the licensed operating period of a nuclear power plant.

The NRC must approve every container design, its regulations cover testing, manufacturing and maintenance.



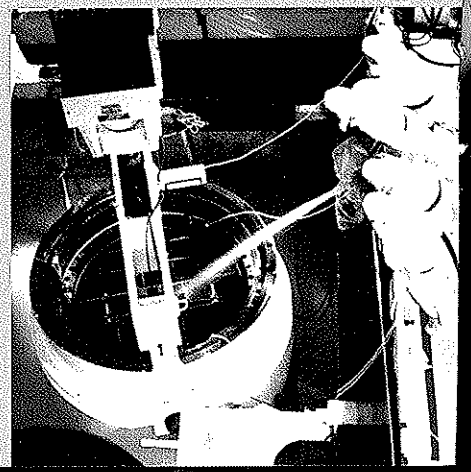
After removing used fuel from the reactor, plant technicians store it in steel-lined, water-filled pools.

Most plants store used fuel in steel-lined, concrete vaults filled with water. In this manner, the water acts as a natural barrier for radiation from the fuel assemblies.

The water also keeps the fuel cool while the radiation decays—or becomes less radioactive. The water itself does not leave the inside of the power plant's concrete building.

Nuclear power plants originally were designed to store at least a decade's worth of used fuel. However, many plants already have run out of used fuel pool capacity. The Nuclear Waste Policy Act of 1982 required the federal government to begin moving used fuel from plant sites in 1998, but it has not yet fulfilled this obligation to begin managing used fuel at a federal facility.

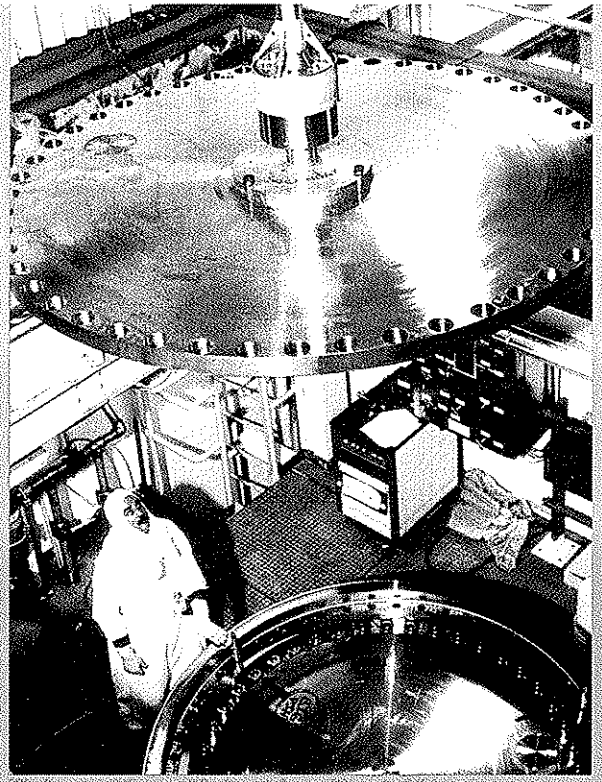
Given current progress at the Yucca Mountain site, designated as the nation's permanent repository for used fuel, the government may not begin to remove used fuel before the facility opens or is near completion—sometime after 2017.



Technicians lift a used fuel canister from the used fuel pool.

Safety and Security Are Integral to Fuel Storage Systems

Many U.S. plants—including several shutdown reactors—have supplemented their storage capacity by building above-ground dry storage facilities known as independent spent fuel storage installations. Since 1986, companies have built 34 such installations, and another 16 are planned. Other countries also have safely and successfully stored used fuel above ground since the mid-1970s.



Workers seal the used fuel container with a steel lid.

A used fuel container moves carefully to the on-site storage facility at less than 5 mph.

Above-ground storage systems—like steel-lined fuel pools—incorporate a number of security features to protect public health and safety.

The foremost safety feature is the robust container itself: steel, steel-reinforced concrete, or steel-enclosed concrete 18 or more inches thick. The containers are extremely rugged, using materials like steel, concrete and lead that also serve as a proven, effective radiation shield. Each container—depending on the design—can hold up to 68 14-foot-long used fuel assemblies.

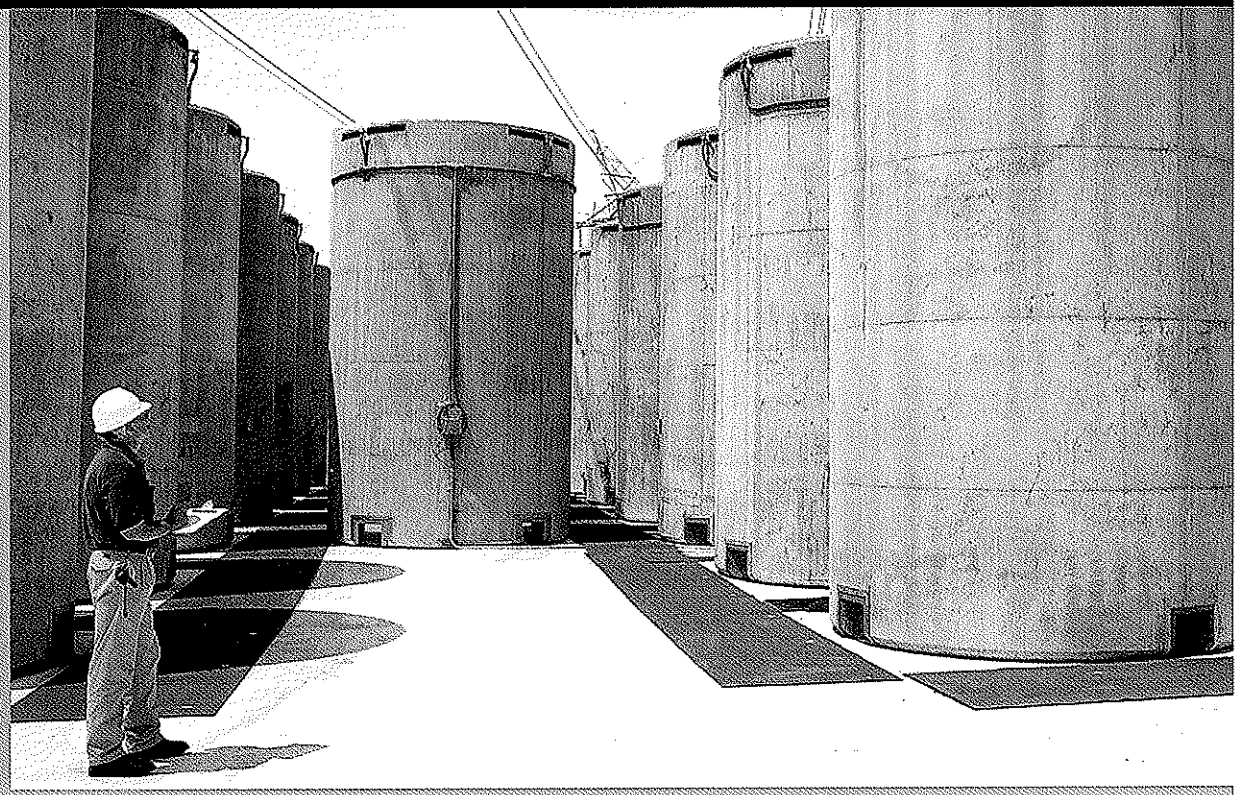
Once loaded, plants store the containers horizontally in a concrete vault, or stand them upright on a 3-foot-thick concrete pad. In 2006, companies were using nearly 830 of these containers safely at U.S. nuclear plant sites.

The makers of dry storage containers design and test the containers to ensure they prevent the release of radioactivity, even under the most extreme conditions—earthquakes, tornadoes, hurricanes, floods and sabotage. All of the designs use natural cooling and require no mechanical devices.

Dry storage containers, like all nuclear plant buildings, are well protected from a potential terrorist attack, whether ground-based or airborne. In tests conducted by the Electric Power Research Institute, a Palo Alto, Calif.-based research organization, dry storage containers proved highly resistant to the impact of a commercial aircraft, as well as difficult targets to strike.

Used Fuel Management Preserves Nuclear Energy Benefits

The NRC must approve each container design, providing additional assurance of safety. The NRC has determined that used fuel can be stored at plant sites without adverse health or safety consequences for at least 30 years beyond the licensed operating life of a nuclear power plant. Nonetheless, the agency requires that dry storage containers be constantly monitored and reinspected periodically.



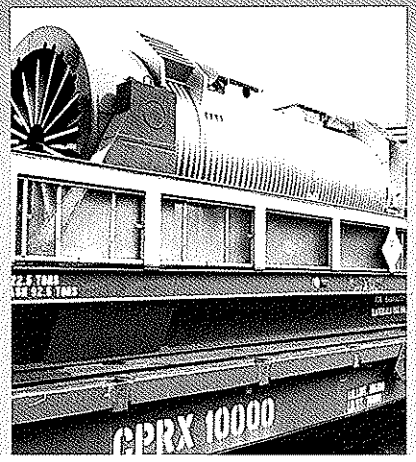
A worker inspects dry storage containers on a concrete storage pad.

At each of America's nuclear power plants, public health and safety are paramount—from the plants' design with multiple barriers and backup operating systems to continual training and testing of the people who run the plants.

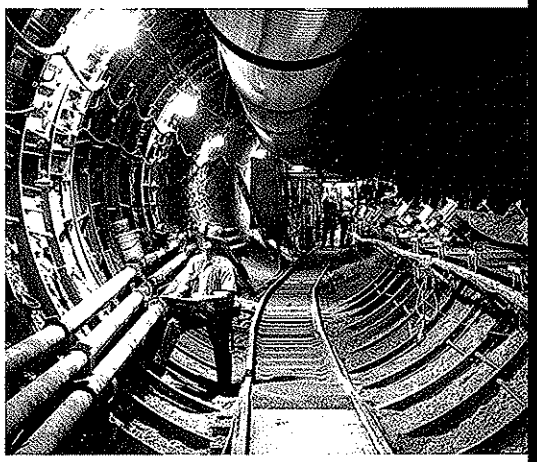
Nuclear power plants are the nation's largest source of clean-air electricity. No other source of electricity in the United States contributes such a large share of energy production while having such a limited environmental impact.

Just as important, as America's second-leading source of electricity, U.S. nuclear plants play a significant role in improving people's lives—whether it's powering offices and factories or providing electricity for a digital economy.

Plant operators are committed to manage the nation's used nuclear fuel safely and responsibly until the federal government opens a centralized repository. Doing so not only protects public health and safety, it also ensures that Americans can enjoy the benefits of reliable, economical and clean-air nuclear energy.



Yucca Mountain, Nevada, is the site of the nation's used fuel repository.



Inside the Yucca Mountain repository.

Centralized Storage Will Hold Down Costs to Consumers

While the use of above-ground, dry storage allows the nation's nuclear power plants to continue providing reliable, economical and clean-air electricity to millions of Americans, a centralized facility still is required.

Nuclear power plants—while carefully and safely managing used fuel for more than four decades—were never built for long-term storage. Experts agree that moving used fuel to a single facility—built specifically for that purpose—will reduce the cost to the public while improving on an already excellent safety record.

The U.S. Department of Energy is developing an underground repository at Yucca Mountain, Nev., that will provide a centralized facility for the nation's used fuel. Until the centralized facility opens, the industry will continue to use dry storage systems subject to the same rigorous safety standards and regulatory oversight as every other aspect of nuclear power plant operations.

Another factor in favor of centralized storage is that dry storage systems are expensive. Depending on the design, a container's cost can range from $500,000 to more than $1 million. Some nuclear plants will need dozens of these containers until the federal government opens the Yucca Mountain facility.

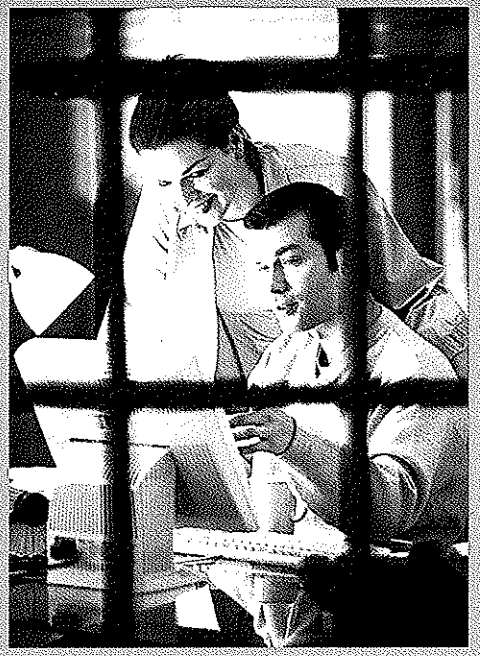
Consumers of nuclear-generated electricity will have to foot the bill for these on-site storage systems, despite the fact the Nuclear Waste Policy Act never envisioned the need for on-site storage.

Just as Electricity Is Part of Daily Life, So Is Nuclear Energy

We live in a wired world. Electricity is vital to everyday life—powering everything from computers to air conditioners, lighting our homes and running our factories. It's one of the greatest achievements of the past century. It fuels America's economy, and it has changed the way we live.

Nuclear energy produces electricity for one in five homes and businesses across the United States, with 104 reactors in 31 states. These reactors operate around the clock and provide reliable electricity to keep our nation's electricity system stable.

We need more electricity and we want clean air. With nuclear energy, we can have both.



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